REMARKS

Status of the claims

Claims 5-10, 12, 14, 15, 27-40, and 52-73 were pending in the present application. By virtue of this amendment, claims 5, 52-55, and 57-66, and 71 have been cancelled, and claims 6-10, 14-15, 27-33, 39-40, 56, 67-70, and 72-73 have been amended. Claims 1-4, 11, 13, 16-26, and 41-51 were previously cancelled, and claim 12 is withdrawn as drawn to a non-elected invention. Accordingly, claims 6-10, 14-15, 27-40, 56, and 67-70, and 72-73 are currently under consideration.

With respect to any claim amendments or cancellations, Applicants have not dedicated to the public or abandoned any unclaimed subject matter and moreover have not acquiesced to any rejections and/or objections made by the Patent Office. Applicants expressly reserve the right to pursue prosecution of any presently excluded subject matter or claim embodiments in one or more future continuation and/or divisional application(s).

Rejection under 35 U.S.C. §101

Claims 5-10, 14, 15, 27-40, and 52-73 are rejected under 35 U.S.C. §101 as allegedly directed to non-statutory subject matter. The claims have been amended herein to recite that the claimed truncated polypeptides are "isolated or purified," as suggested in the Office Action, thereby rendering the rejection moot.

In view of the foregoing, Applicants respectfully request reconsideration and withdrawal of the rejection under 35 U.S.C. §101.

Rejection under 35 U.S.C. §112, first paragraph

Claims 14, 15, and 67-73 are rejected under 35 U.S.C. §112, first paragraph, as allegedly non-enabled with respect to truncated pullulanases that are encoded by a polynucleotide having 90% sequence identity to the DNA sequence of SEQ ID NO:1. Solely to expedite prosecution and without acquiescence to the rejection, the language "said nucleic acid having at least 90% identity to the polynucleotide sequence as shown in SEQ ID NO:1" has been deleted from the claims as amended herein, rendering the rejection moot.

In view of the foregoing, Applicants respectfully request reconsideration and withdrawal of the rejection under 35 U.S.C. §112, first paragraph

Rejections under 35 U.S.C. §112, second paragraph

Claims 5-10, 14, 15, 27-30, 33-40, 52-57, and 60-71 are rejected under 35 U.S.C. §112, second paragraph, as allegedly indefinite due to recitation of the term "about." Solely to expedite prosecution and without acquiescence to the rejection, "about" has been deleted from the claims, rendering the rejection moot.

In view of the foregoing, Applicants respectfully request reconsideration and withdrawal of the rejection under 35 U.S.C. §112, second paragraph.

Claims 6-10, 27-30, and 58-62 are rejected under 35 U.S.C. §112, second paragraph, as allegedly indefinite due to absence of a reference sequence in the claims. The claims have been amended herein to recite SEQ ID NO:2 as a reference sequence.

In view of the foregoing, Applicants respectfully request reconsideration and withdrawal of the rejection under 35 U.S.C. §112, second paragraph.

Claims 39 and 40 are rejected under 35 U.S.C. §112, second paragraph, as allegedly indefinite in view of the language "at least 60% truncated pullulanase" or "at least 80% pullulanase," respectively. Solely for clarification, these claims have been amended herein to recite "at least 60% pullulanase activity" or "at least 80% pullulanase activity." Support for these amendments is provided on page 3, lines 31-33, of the application as filed.

In view of the foregoing, Applicants respectfully request reconsideration and withdrawal of the rejection under 35 U.S.C. §112, second paragraph.

Claims 31 and 32 are rejected under 35 U.S.C. §112, second paragraph, as allegedly indefinite in view of the recitation of amino acids 99 and 103 of SEQ ID NO:2 as E, whereas the sequence listing shows amino acids 99 and 103 as K and A, respectively. The claim language at issue has been deleted from the claims as amended herein, rendering the rejection moot.

In view of the foregoing, Applicants respectfully request reconsideration and withdrawal

of the rejection under 35 U.S.C. §112, second paragraph.

Claims 5, 58, and 59 are rejected under 35 U.S.C. §112, second paragraph, as allegedly indefinite in view of the claim language "the designation T89.117D in the LMG culture collection." Claims 5, 58, and 59 have been cancelled herein, rendering the rejection moot.

In view of the foregoing, Applicants respectfully request reconsideration and withdrawal of the rejection under 35 U.S.C. §112, second paragraph.

Claims 52-57 and 70-73 are rejected under 35 U.S.C. §112, second paragraph, as allegedly indefinite for reciting SEQ ID NO:2 in a fashion that allegedly implies that it is the mature pullulanase from which all the deletions are made. The Examiner suggests amending the claims to refer to the mature form of the pullulanase of SEQ ID NO:2. Solely to expedite prosecution and without acquiescence to the rejection, all of the pending claims have been amended herein to refer to the mature form of the *Bacillus deramificans* pullulanase of SEQ ID NO:2, rendering the rejection moot.

In view of the foregoing, Applicants respectfully request reconsideration and withdrawal of the rejection under 35 U.S.C. §112, second paragraph.

Claims 60-64 are rejected under 35 U.S.C. §112, second paragraph, as allegedly indefinite due to recitation that the pullulanase fragment further comprises the amino acids VWAP. Claims 60-64 have been canceled herein, rendering the rejection moot.

In view of the foregoing, Applicants respectfully request reconsideration and withdrawal of the rejection under 35 U.S.C. §112, second paragraph.

Claim 65 is rejected under 35 U.S.C. §112, second paragraph, as allegedly indefinite due to recitation of "and/or" with respect to a Markush group and lack of the article "a" or "an" before the listed members of the Markush group. Claim 65 has been canceled herein. However, solely to expedite prosecution and without acquiescence to the rejection, claim 33, which included the same claim language that was the subject of the rejection of claim 65, has been amended herein to incorporate the Examiner's preferred language.

In view of the foregoing, Applicants respectfully request reconsideration and withdrawal of the rejection under 35 U.S.C. §112, second paragraph.

Rejection under 35 U.S.C. §102(a)

Claims 27-30, 33-40, 55, and 64 are rejected under 35 U.S.C. §102(a) as allegedly anticipated by Deweer et al., U.S. Patent No. 5,721,128 ("the '128 patent"). Applicants respectfully traverse this rejection.

In order to anticipate, a cited reference must teach each and every element of a claimed invention. The '128 patent does not teach the presently claimed deletions of 98, 102, 100, 200, or 300 amino acids from the N-terminus of the mature form of the *Bacillus deramificans* pullulanase of SEQ ID NO:2. Thus, the '128 patent fails to satisfy the requirement of teaching all elements of the rejected claims and is not an anticipatory reference.

In view of the foregoing, Applicants respectfully request reconsideration and withdrawal of the rejection under 35 U.S.C. §102(a).

Rejection under 35 U.S.C. §103(a)

Claims 5-8, 14, 15, 27-40, 52-57, and 60-71 are rejected as allegedly unpatentable under 35 U.S.C. §103(a) over the '128 patent, McPherson et al. (1988) *Biochemical Soc Trans* 16(5):723-24 ("McPherson"), and Albertson et al. (1997) *Biochem Biophys Acta* 1354:35-39 ("Albertson"). Applicants respectfully traverse this rejection.

To support an obviousness rejection, a combination of references must teach or suggest all elements of a claimed invention. As discussed above, the '128 patent does not teach the claimed deletions of 98, 102, 100, 200, or 300 amino acids from the N-terminus of the mature form of the *Bacillus deramificans* pullulanase of SEQ ID NO:2. The '128 patent also does not suggest such deletions. The '128 patent does not suggest any truncation of the pullulanase enzyme disclosed therein and does not suggest such a modification or even speculate about the desirability of truncating the enzyme. The '128 patent prophetically describes a modified pullulanase "in which the amino acid sequence differs from that of the wild enzyme by at least one amino acid" (Col. 5, lines 59-16), referring to techniques such as chemical mutagenesis or genetic engineering techniques such as site-directed or random mutagenesis of the wild-type

protein sequence (Col. 5, lines 62-67). However, the '128 patent does not suggest *truncation* of the enzyme, as currently claimed.

McPherson and Albertson do not cure the deficiencies of the '128 patent. Neither of these references teaches or suggests a truncated *Bacillus deramificans* pullulanase of SEQ ID NO:2 with a deletion of 98, 102, 100, 200, or 300 amino acids from the N-terminus of the mature enzyme. Both of these references are directed to pullulanase enzymes from unrelated species and with very different amino acid species. Thus, the cited combination of references does not teach or suggest all of the elements of the claimed invention and does not render the present invention obvious.

A further requirement for an obviousness rejection under 35 U.S.C. §103(a) is that the references must provide a reasonable expectation of success to a skilled artisan in practicing the claimed invention. The cited combination of references does not fulfill this requirement. As discussed above, the '128 patent does not teach or suggest *any* truncation the *Bacillus deramificans* pullulanase of SEQ ID NO:2, much less the claimed deletions of 98, 102, 100, 200, or 300 N-terminal amino acids. McPherson and Albertson relate to enzymes from unrelated species with low sequence identity to the *Bacillus deramificans* pullulanase. A person of skill in the art would not expect a disclosure about a pullulanase enzyme from one species to apply to a pullulanase enzyme from a different, unrelated species, in particular when there is low sequence identity between the enzymes from the two species.

Albertson describes the cloning of a gene that encodes an extracellular pullulanase from the "extreme thermophile" *Caldicellulosiruptor saccharolyticus*, referred to by the authors as the PulA gene. The authors state that the enzyme most closely related to PulA is the pullulanase encoded by the PulB gene of *Bacillus acidopullulolyticus*, with *only about 35% identity* to *C. saccharolyticus* PulA. The authors also state that no three-dimensional structure for a pullulanase had been determined. Thus, in view of the differing growth environments, the low sequence identity, and the lack of a three-dimensional structure at time of filing, a skilled artisan would not predict success in applying the teachings of Albertson to the pullulanase enzyme from the unrelated species *Bacillus deramificans*. One of skill in the art would not look to a reference describing an extreme thermophilic, obligately anaerobic asporogenous bacterium to provide information relevant to *Bacillus*, a rod-shaped, Gram-positive, sporulating aerobe or facultative

anaerobe bacterium, in the absence of information suggesting sequence or structural relatedness between the enzymes from the two divergent species.

Further, the "truncation" described by Albertson may not have been a true truncation. The active "truncated" pullulanase may have actually been the full-length enzyme, resulting from an internal start sequence. On page 38, top of column 1, Albertson states that "[a] possible internal start sequence complete with a ribosome binding site could also be detected internally within the pullulanase gene (see Fig. 2), and this feature may explain the occurrence of enzymatic activity from the incomplete recombinant plasmid pNZ1452." Thus, the active pullulanase observed by Albertson may not have been truncated, and this introduces ambiguity into interpretation of the teaching of this reference.

As with Albertson, McPherson describes an enzyme with very little sequence similarity to the pullulanase from *Bacillus deramificans*. The pullulanase taught by McPherson has *less than 30% identity and about 40% similarity* to the full length enzyme from which the presently claimed enzymes are derived. McPherson states that "[t]he predicted amino acid sequences of pullulanases from *Klebsiella pneumoniae* strains W70 . . . and FG9 . . . are *very similar* and *provide the basis* for the design of experiments to examine pullulanase function." Page 723, first paragraph; emphasis added. Thus, McPherson teaches that similarity in protein sequences was critical to the design of experiments to determine a "core" active pullulanase sequence. In view of the dissimilarity in sequence between *Klebsiella pneumoniae* and *Bacillus deramificans* and the statement by McPherson that sequence similarity provided the basis for their experiments, a person of skill in the art would not predict success in applying the teaching of McPherson to modification of the *B. deramificans* pullulanase as claimed.

In summary, the cited combination of references does not provide a reasonable expectation of success with regard to the claimed invention. The '128 patent does not provide any guidance that would suggest the claimed modifications would produce an active enzyme, and Albertson and McPherson are directed to enzymes from divergent species with low sequence similarity to the claimed enzyme. A person of skill in the art would not predict success in truncating the *Bacillus deramificans* pullulanase taught in the '128 patent from the teachings of Albertson and McPherson, since these references are directed to different species and enzymes than those with which the '128 patent is concerned.

In view of the foregoing, Applicants respectfully request reconsideration and withdrawal of the rejection under 35 U.S.C. §103(a).

Double patenting

Claims 5-10, 14, 15, 27-30, 33-40, and 52-71 are rejected as allegedly unpatentable over claims 1, 3, 4, and 6-11 of Deweer et al., U.S. Patent No. 6,047,854 ("the '854 patent") on the basis of nonstatutory obviousness-type double patenting, either alone or in view of McPherson et al. and Albertson et al. Applicants respectfully traverse this rejection.

The presently claimed pullulanase enzymes are patentably distinct from those claimed in the '854 patent. The cited claims of the '854 patent neither teach nor suggest the specifically claimed modifications of 98, 100, 102, 200,or 300 amino acid deletions from the N-terminus of the mature enzyme. The cited claims of the '854 patent are directed to enzymatic compositions comprising a pullulanase produced by *Bacillus deramificans* or a derivative or mutant strain thereof. The currently claimed pullulanase truncation species are patentably distinct from the genus of pullulanase enzymes recited in the claims of the '854 patent.

As discussed above, neither McPherson nor Albertson teach or suggest the presently claimed truncations. Albertson and McPherson describe enzymes from very different species and with very different sequences than those currently claimed. These references are not relevant to the double patenting rejection, since neither the claims nor the disclosure of the reference patent recites or suggests the currently claimed modifications.

In view of the foregoing, Applicants respectfully request reconsideration and withdrawal of the double patenting rejection.

Claims 5-10, 14, 15, 27-30, 33-40, and 52-71 are rejected as allegedly unpatentable over claims 5-6 of Deweer et al., U.S. Patent No. 5,721,127 ("the '127 patent") on the basis of nonstatutory obviousness-type double patenting, either alone or in view of McPherson et al. and Albertson et al. Applicants respectfully traverse this rejection.

The presently claimed pullulanase enzymes are patentably distinct from those claimed in the '127 patent. The cited claims of the '127 patent neither teach nor suggest the specifically

claimed modifications of 98, 100, 102, 200,or 300 amino acid deletions from the N-terminus of the mature enzyme. The cited claims of the '127 patent are directed to pullulanase enzymes obtained from a transformed strain of *Bacillus licheniformis* encoded by a nucleotide sequence encoding the full length *B. deramificans* pullulanase or a modified sequence derived therefrom. The currently claimed pullulanase truncation species are patentably distinct from the genus of pullulanase enzymes recited in the claims of the '854 patent.

As discussed above, neither McPherson nor Albertson teach or suggest the presently claimed truncations. Albertson and McPherson describe enzymes from very different species and with very different sequences than those currently claimed. These references are not relevant to the double patenting rejection, since neither the claims nor the disclosure of the reference patent recites or suggests the currently claimed modifications.

In view of the foregoing, Applicants respectfully request reconsideration and withdrawal of the double patenting rejection.

CONCLUSION

In view of the above, each of the presently pending claims in this application is believed to be in immediate condition for allowance. Accordingly, the Examiner is respectfully requested to withdraw the outstanding rejection of the claims and to pass this application to issue. If it is determined that a telephone conference would expedite the prosecution of this application, the Examiner is invited to telephone the undersigned at the number given below.

In the event the U.S. Patent and Trademark Office determines that an extension and/or other relief is required, Applicants petition for any required relief including extensions of time and authorize the Commissioner to charge the cost of such petitions and/or other fees due in connection with the filing of this document to Deposit Account No. 07-1048, referencing Docket No. GC396-2. However, the Commissioner is not authorized to charge the cost of the issue fee to the Deposit Account.

Respectfully submitted,

Dated: July 8, 2008

By /Jill A. Jacobson/
Jill A. Jacobson
Registration No.: 40,030

Danisco US Inc., Genencor Division
925 Page Mill Road
Palo Alto, CA 94304-1013
Tel: 650-846-4072
Fax: 650-845-6504